

UNCLASSIFIED

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 2000	
BUDGET ACTIVITY 02 - Applied Research				PE NUMBER AND TITLE 0602602F Conventional Munitions					
COST (\$ in Thousands)	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	39,106	37,892	45,223	45,350	47,597	48,985	50,450	Continuing	TBD
622068 Advanced Guidance Technology	15,706	12,454	0	0	0	0	0	Continuing	TBD
622502 Ordnance Technology	23,400	25,438	45,223	45,350	47,597	48,985	50,450	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: Beginning in FY 2001, Project 622068 is combined with Project 622502.

(U) **A. Mission Description**
This program investigates, develops and establishes the technical feasibility and military utility of advanced ordnance and guidance technologies for conventional air-launched munitions to defeat mobile surface targets, high value fixed surface targets, and airborne targets. The program includes development of: (1) conventional ordnance technologies including warheads, fuzes, explosives, munition integration, and conventional weapon lethality and vulnerability assessments; and (2) advanced guidance technologies including seekers, navigation and control, target detection and identification algorithms, and simulation assessments for affordable precision conventional weapons. Payoffs from this technology investment are more affordable and effective conventional weapons that can be used against the full target spectrum in normal and adverse weather and battlefield conditions while reducing collateral damage.

(U) **B. Budget Activity Justification**
This Program is in Budget Activity 2, Applied Research, since it develops and determines the technical feasibility and military utility of evolutionary and revolutionary technologies.

(U) **C. Program Change Summary (\$ in Thousands)**

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 2000 PBR)	40,386	42,205	46,840	
(U) Appropriated Value	41,529	38,205		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-1,143	-61		
b. Small Business Innovative Research	-658			
c. Omnibus or Other Above Threshold Reprogram		-126		

UNCLASSIFIED

UNCLASSIFIED

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE

February 2000

BUDGET ACTIVITY

PE NUMBER AND TITLE

02 - Applied Research**0602602F Conventional Munitions**(U) C. Program Change Summary (\$ in Thousands) Continued

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>Total Cost</u>
d. Below Threshold Reprogram	-403			
e. Rescissions	-219	-126		
f. Other				TBD
(U) Adjustments to Budget Years Since FY 2000 PBR			-1,617	
(U) Current Budget Submit/FY 2001 PBR	39,106	37,892	45,223	TBD

(U) Significant Program Changes:

Changes to this program since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

UNCLASSIFIED

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)								DATE February 2000	
BUDGET ACTIVITY 02 - Applied Research				PE NUMBER AND TITLE 0602602F Conventional Munitions				PROJECT 622068	
COST (\$ in Thousands)	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
622068 Advanced Guidance Technology	15,706	12,454	0	0	0	0	0	Continuing	TBD
<p>(U) <u>A. Mission Description</u> This project investigates, develops, and evaluates conventional munition advanced guidance technologies to establish technical feasibility and military utility. This project includes development of advanced guidance including terminal seekers, navigation and control, target detection and identification algorithms, and guidance and control simulations. Project payoffs include: adverse weather and 'launch and leave' precision guidance capability; increased number of kills per sortie; increased pilot and aerospace vehicle survivability; improved weapon reliability; more affordable weapons; reduced collateral damage; and increased effectiveness of conventional weapons.</p> <p>(U) <u>FY 1999 (\$ in Thousands)</u></p> <p>(U) \$3,888 Investigated and developed advanced component technology for low-cost, precision, adverse weather autonomous seekers that will allow increased standoff launch ranges, reduced pilot workload, and improved aerospace vehicle survivability.</p> <p>(U) \$8,133 Investigated and developed advanced navigation and control technologies for current and future munitions that will decrease pilot workload and increase survivability.</p> <p>(U) \$1,780 Investigated and developed advanced optical and digital processors and advanced target detection/classification/identification algorithms for autonomous seekers that will provide the basis for smart autonomous weapons that will decrease pilot workload and increase survivability.</p> <p>(U) \$1,905 Investigated and developed detailed six degree of freedom and hardware-in-the-loop simulations and models for the analysis of guided munitions and their components to enable requirement studies, design iteration/evaluation, and experiment risk reduction. These advanced simulations will shorten development time, reduce development cost, and provide more effective munitions that will reduce cost per kill.</p> <p>(U) \$15,706 Total</p> <p>(U) <u>FY 2000 (\$ in Thousands)</u></p> <p>(U) \$4,067 Investigate and develop advanced component technology for low-cost, precision, adverse weather autonomous seekers that will allow increased standoff launch ranges, reduced pilot workload, and improved aerospace vehicle survivability.</p> <p>(U) \$4,611 Investigate and develop advanced navigation and control technologies for current and future munitions that will decrease pilot workload and increase survivability.</p> <p>(U) \$2,076 Investigate and develop advanced optical and digital processors and advanced target detection/classification/identification algorithms for autonomous seekers that will provide the basis for smart autonomous weapons that will decrease pilot workload and increase survivability.</p> <p>(U) \$1,700 Investigate and develop detailed six degree of freedom and hardware-in-the-loop simulations and models for the analysis of guided munitions</p>									
<div style="display: flex; justify-content: space-between;"> Project 622068 Page 3 of 8 Pages Exhibit R-2A (PE 0602602F) </div>									

UNCLASSIFIED

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)		DATE February 2000
BUDGET ACTIVITY 02 - Applied Research	PE NUMBER AND TITLE 0602602F Conventional Munitions	
		PROJECT 622068

(U) **A. Mission Description Continued**

(U) **FY 2000 (\$ in Thousands) Continued**

and their components to enable requirement studies, design iteration/evaluation, and experiment risk reduction. These advanced simulations will shorten development time, reduce development cost, and provide more effective munitions that will reduce cost per kill.

(U) \$12,454 Total

(U) **FY 2001 (\$ in Thousands)**

(U) \$0 Effort moved to Project 622502.

(U) \$0 Total

(U) **B. Project Change Summary**

Not Applicable.

(U) **C. Other Program Funding Summary (\$ in Thousands)**

(U) Related Activities:

(U) PE 0603601F, Conventional Weapons Technology.

(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) **D. Acquisition Strategy**

Not Applicable.

(U) **E. Schedule Profile**

(U) Not Applicable.

Project 622068
Page 4 of 8 Pages
Exhibit R-2A (PE 0602602F)

UNCLASSIFIED

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)								DATE February 2000	
BUDGET ACTIVITY 02 - Applied Research				PE NUMBER AND TITLE 0602602F Conventional Munitions				PROJECT 622502	
COST (\$ in Thousands)	FY 1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
622502 Ordnance Technology	23,400	25,438	45,223	45,350	47,597	48,985	50,450	Continuing	TBD
<p>(U) <u>A. Mission Description</u> This project investigates, develops, and evaluates conventional munition technologies to establish technical feasibility and military utility. Included in this project are technologies for advanced conventional weapon dispensers, submunitions, safe and arm devices, fuzes, explosives, conventional warheads, and weapon airframe and carriage technology. It also assesses the lethality and effectiveness of current and planned conventional weapons technology programs and assesses target vulnerability. This project also includes development of advanced conventional munition guidance including terminal seekers, navigation and control, target detection and identification algorithms, and guidance/control simulations. The payoffs include: improved storage capability and transportation safety of fully assembled weapons; improved non-nuclear warhead and fuze effectiveness; improved submunition dispensing; low-cost airframe/subsystem components and structures; reduced aerospace vehicle/weapons drag and radar signature; accurate long-range navigation and control, affordable precision terminal seekers; and advanced digital simulation capabilities.</p>									
(U) <u>FY 1999 (\$ in Thousands)</u>									
(U) \$6,512	Investigated and developed high fidelity analytical tools including computational mechanics model for calculating weapons effects and assessing lethality and vulnerability. Quantified and characterized the coupling of destructive energy into the target, and the means to translate that information into advanced analytical methods for predicting weapon effectiveness. These tools will reduce development time and cost while providing more effective munitions to the Air Force.								
(U) \$2,238	Investigated and developed new affordable explosives that provide higher performance and lower sensitivity for development of advanced munitions that will provide more effective munitions to the Air Force and reduce cost per kill.								
(U) \$3,332	Investigated and developed fuze, and safe and arm technology for advanced munitions that will reduce cost and provide increased weapons supportability, safety, and performance for the Air Force.								
(U) \$4,695	Investigated and developed advanced control and carriage technologies for integrated ordnance packages with enhanced lethality for current and future air launched weapons that will provide increased accuracy, lethality, and loadout while improving aircrew survivability and decreasing pilot workload.								
(U) \$6,623	Investigated and developed advanced warhead development technologies and advanced kill mechanisms to enhance munitions lethality that will allow reduced sortie rates and lower cost per kill.								
(U) \$23,400	Total								
<div style="display: flex; justify-content: space-between;"> Project 622502 Page 5 of 8 Pages Exhibit R-2A (PE 0602602F) </div>									

UNCLASSIFIED

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)		DATE February 2000
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
02 - Applied Research	0602602F Conventional Munitions	622502
(U) <u>A. Mission Description Continued</u>		
(U) <u>FY 2000 (\$ in Thousands)</u>		
(U) \$6,625	Investigate and develop high fidelity analytical tools such as computational mechanics models for predicting weapons effects and assessing target vulnerability. These analysis tools will reduce air-delivered munitions development costs and provide weapons that can generate maximum lethality against a given target class.	
(U) \$2,452	Investigate and develop more affordable explosives that provide both higher blast performance and lower ignition sensitivity for air-delivered munitions. This technology will allow the Air Force and Navy to develop safer, less expensive explosive fills for inventory and future weapons.	
(U) \$5,761	Investigate and develop advanced fuze and safe/arm technologies for air-delivered munitions to enhance lethality through precise selection of burst height either at, above, or below the surface. These technologies will increase weapon safety and tactical performance while simultaneously decreasing procurement costs and system supportability requirements.	
(U) \$4,603	Investigate and develop advanced air-delivered munition control and carriage technologies for integrated ordnance packages in order to enhance weapon lethality. These technologies will contribute to increased weapon loadout on strike aircraft and increased sortie effectiveness.	
(U) \$5,997	Investigate and develop advanced warhead kill mechanisms to enhance air-delivered munition lethality. These advanced kill mechanisms allow a smaller warhead to have the effectiveness of a larger one, thereby enabling the development of smaller munitions with corresponding increases in strike aircraft loadout and sortie effectiveness.	
(U) \$25,438	Total	
(U) <u>FY 2001 (\$ in Thousands)</u>		
(U) \$6,736	Investigate and develop high fidelity analytical tools such as computational mechanics models for predicting weapons effects and assessing target vulnerability which will reduce warhead development time and cost, thereby providing more effective munitions to the Air Force. Investigate demilitarization concepts for the 1000-pound unitary general purpose bomb. Develop a high level model, including models of geological structures, of the processes involved in predicting penetrator performance. Investigate innovative kill mechanisms for defeating Weapons of Mass Destruction (WMD). Transition selected high fidelity analytical tools to weapon designers in DoD and industry.	
(U) \$3,316	Investigate and develop more efficient affordable explosives that provide both higher blast performance and lower ignition sensitivity for air-delivered munitions. This technology will enable the Air Force and Navy to develop safer, less expensive explosive fills for inventory and future weapons. Complete warhead testing and evaluation of the reformulated MNX-221 explosive to verify improved density and reduced ignition sensitivity. Continue development of a new class of energetic materials based on nano-scale and microscale particles, with initial emphasis on improving handling safety. Initiate development of innovative explosives technologies that allow concentration of the explosive effects on the target, thereby reducing potential collateral damage.	
(U) \$5,343	Investigate and develop advanced fuze, including safe and arm, technologies for air-delivered munitions to enhance lethality through precise selection of burst height either at, above, or below the surface to increase weapon safety and tactical performance while simultaneously	
Project 622502	Page 6 of 8 Pages	Exhibit R-2A (PE 0602602F)

UNCLASSIFIED

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)		DATE February 2000
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
02 - Applied Research	0602602F Conventional Munitions	622502
(U) <u>A. Mission Description Continued</u>		
(U) <u>FY 2001 (\$ in Thousands) Continued</u>		
	decreasing procurement costs and system supportability requirements. Investigate MicroElectro Mechanical System (MEMS) technology concepts for safe and arm components and fuze accelerometers. Develop a low threshold energy shock hardened detector for multi-event hard target fuze capable of 4000 feet/second impacts. Initiate testing of the multi-event hard target fuze.	
(U) \$5,317	Investigate and develop advanced air-delivered munition control and carriage technologies for integrated ordnance packages in order to enhance weapon lethality. These technologies will contribute to increased weapon loadout on strike aircraft and increased sortie effectiveness. Design, fabricate, and test submunitions for survivability during high mach number dispense. Begin ground testing of technologies that will enable the development of a fast reaction weapon to engage and destroy time-critical targets. Investigate emerging military and commercial communication architectures to determine if they can be utilized to improve munitions planning, performance, and deployment.	
(U) \$7,491	Investigate and develop advanced warhead kill mechanisms to enhance air-delivered munition lethality and enable the development of smaller munitions, with effectiveness similar to current inventory weapons, which would result in a corresponding increase in strike aircraft loadout and sortie effectiveness. Perform subscale and full-scale experiments of several candidate payload technologies to determine their effectiveness to neutralize, deny, or destroy specially formulated chemical/biological targets. Continue testing and characterizing the effectiveness of tantalum warheads against targets which simulate the full spectrum of ground mobile threats. Complete in-house research on the effects of explosives on chemical/biological containers to determine residual collateral damage effects to areas surrounding the target area. Complete research on explosive compressor generators as novel non-lethal kill mechanisms.	
(U) \$5,020	Investigate and develop advanced component technologies for lower cost, enhanced precision, adverse weather, and autonomous seekers for air-delivered munitions that will enable the development of next generation seekers that will increase a weapon's kill probability, reduce pilot work load, and enhance sortie effectiveness. Design and fabricate the subsystems for a gimbaless laser radar with total electronic scanning.	
(U) \$6,447	Develop and validate advanced algorithms that identify mobile targets using their unique external components, such as guns or antenna. Investigate and develop advanced navigation and control technologies for air-delivered munitions that will allow a more efficient flight path to the target, increase standoff ranges, enhancing strike aircraft effectiveness and survivability. Includes investigation of guidance/control technologies deemed 'revolutionary' that may provide significantly enhanced capability to locate and engage a moving or partially hidden target. Develop a low-cost multisensor navigation sensor using MicroElectro Mechanical System (MEMS) technology that can meet tactical grade performance in a low-cost package. Fabricate brassboard components and begin integration of the brassboard intended for field testing. Integrate brassboard components of advanced Global Positioning System to begin laboratory bench tests.	
(U) \$2,992	Investigate and develop advanced optical and digital processors and target detection/classification/identification algorithms for improved seeker performance to allow greater air-delivered weapon autonomy that will further deny an enemy's ability to hide or camouflage a target while decreasing the pilot's workload. Complete the phenomenology studies required to validate the performance enhancements to be realized with a	
Project 622502	Page 7 of 8 Pages	Exhibit R-2A (PE 0602602F)

UNCLASSIFIED

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)		DATE February 2000
BUDGET ACTIVITY 02 - Applied Research	PE NUMBER AND TITLE 0602602F Conventional Munitions	PROJECT 622502
<p>(U) <u>A. Mission Description Continued</u></p> <p>(U) <u>FY 2001 (\$ in Thousands) Continued</u></p> <p>dual-mode millimeter wave and infrared seeker. Develop the analytical tools required to enhance the development, test, and analysis of advanced seekers and target detection and identification processors. Investigate optical processing and components technologies that increase sensor field of view, tracking rates, and target resolution.</p> <p>(U) \$2,561 Investigate and develop detailed six degree of freedom and hardware-in-the-loop simulations and models to analyze guided munitions or their components to enable requirements studies, design iteration/evaluation, and experiment risk reduction that will shorten development time, reduce development cost, and provide more effective munitions. Develop tactical scene generation capability to produce reuseable government-owned acquisition and targeting software algorithms for guided munition seekers. Complete the analysis of air-to-surface terminal fuzing. Develop in-house personal computer-based simulations for analysis of advanced weapon concepts.</p> <p>(U) \$45,223 Total</p> <p>(U) <u>B. Project Change Summary</u> Not Applicable.</p> <p>(U) <u>C. Other Program Funding Summary (\$ in Thousands)</u></p> <p>(U) Related Activities:</p> <p>(U) PE 0603601F, Conventional Weapons Technology.</p> <p>(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.</p> <p>(U) <u>D. Acquisition Strategy</u> Not Applicable.</p> <p>(U) <u>E. Schedule Profile</u></p> <p>(U) Not Applicable.</p>		
Project 622502	Page 8 of 8 Pages	Exhibit R-2A (PE 0602602F)